reference beam into at least three substantially identical reference beams." See claim 1, subparagraph (e). While the Examiner is clearly aware of this limitation (based on the Sec. 112 rejection set forth in Section 2, second paragraph, of the Office Action), it is totally ignored in Section 4, paragraph 2, p. 3, of the Office Action. (All the Examiner states is "Bencze et al further teaches that *a set of beam* splitters (26, 39, and 42) placed in the reference beam path serves as *the means for dividing the reference beam (7)* into *at least three reference beams* (38, 41, 44) … .") Not only is the 1.(e) limitation ignored, it is clear from Bencze, et al. that their three reference beams are <u>not</u> identical. Figure 5 of this reference clearly shows the reference beams to be of unequal lengths. Further, because of the use of beam splitters 36, 39 and 42, the intensity of the reference beam is reduced each time it is divided. Based on what is stated and illustrated, the reference beams are neither identical in length nor identical in intensity. Thus, contrary to the Examiner's assertion, Bencze et al. has <u>not</u> "met all the limitations of the claims with the exception that it does not teach explicitly that the shutter for the object beam is placed between the means for dividing and the recording medium."

why

So does the instant application

why ?

In addition to the foregoing, there is no disclosure in Bencze et al. or in Klug et al. to support the Examiner's contention that:

> It would have been obvious to one skilled in the art to apply the teachings of Klug et al modify the arrangement of Bencze et al to put the shutter at the object beam path between the beam splitter and the recording medium for the benefit of allowing individual control of the object beam without effecting the light beam generated to other part[s] of the apparatus.

Bencze et al. and Klug et al. disclose different inventions, used for different purposes. Beyond the fact that, broadly speaking, they relate to holography, they are not "in the same field of endeavor." Bencze et al. relates to:

> ... a method of and an apparatus for detecting errors on a photomask with respect to a standard photomask by subtraction technique. Such photomasks can preferably be used in the production of integrated circuits or the like, e.g. of magnetic bubble memories.

Klug et al. on the other hand, relates to apparatus for replicating a hologram, particularly holographic stereogram. Bencze et al. uses a single coherent light source 1 (illustrated in all of Figures 1-5). In contrast, Klug et al. utilizes three different colored lasers to produce red, green and blue object beams (which may, or may not, be combined).

The Examiner's comment with regard to Klug et al. that "shutter means (225, Figure 7) is placed at the object beam path between the beam splitter (205) and the recording medium" is vague and indefinite. The impression one gets from the first paragraph on page 4 of the Office Action is that Klug et al. have one shutter and one object beam. This is clearly not what is disclosed by Figure 7 or the associated discussion. Klug et al. discloses three object beams, each labeled 20, and one reference beam, labeled 25. All four beams have beam shutters 225. The purpose of placing a shutter in each object beam is tied to the fact that there are multiple lasers (i.e., red, green and blue), which "allows separate elemental holograms to be printed in different colors." See col. 11, *ll.* 54-55.

> For instance, by placing a beam shutter in the path of each object beam and reference beam and then selectively closing the beam shutters, one elemental hologram may be exposed to only red object and reference beams, another may be exposed to only green object and reference beams,

and another may be exposed to only blue object and
reference beams.

See, again, col. 11, *ll.* 55-62.

Given the very different purposes of the respective apparatus of Bencze et al. and Klug et al. (detecting errors on a photomask vs. printing holographic stereograms utilizing a steerable reference beam), given that Bencze et al. has only one source while Klug et al. has three, given that Bencze et al. has only one object beam while Klug et al. has three, and given that Bencze et al. (in Figure 5) has three reference beams while Klug et al. has only one, it would not be obvious to "modify the arrangement of Bencze et al. to put the shutter at the object beam path ... " as asserted by the Examiner. In short, the only suggestion for relocating the shutter 3 of Bencze et al. is found in Applicant's disclosure, not the cited prior art. The Examiner is clearly picking portions of the prior art, based on Applicant's disclosure, and not basing the rejection on any motivation or suggestion provided by the references to Bencze et al. or Klug et al.

Part of dividing the beam. does not dependent on whether the beam is used as object or reference beam

The additional rejection of claim 2, and those claims which depend therefrom, as obvious in view of Bencze et al. considered with Klug et al. is also traversed. As to claim 2, Applicant's traverse of the rejection of claim 1 in view of these two references is incorporated by reference. Additionally, the embodiment(s) of Figures 17 and 18 of Klug et al. disclose the use of only a single reference fiber optic cable 650. Not relevant. The embodiment of Figure 19 discloses "three reference beams 25 which may each be a different color." See col. 15, *ll.* 23-24. These three reference beams are fed into "optical combiner unit ... which may combine the three reference beams 25 into a single reference beam 25." See col. 15, *ll.* 26-31. The three cables 650 are not shown to have the same length. Further, the specification is silent on this issue. Thus, there is no

disclosure of the limitations set forth in claim 1.(e) and 3. The Examiner's contention that the beam paths for the reference for the referenced and object beams "are of certain path length" does not make sense. The embodiment of Figures 20 and 21 uses fiber optic cables 650 for the object beams. Even if this was relevant, and it's not, the cables are not shown or described as being identical. The embodiments of Figures 23-26 are similarly defective.

The rejection of claim 4 is also traversed. As this claim depends from claims 1-3, the traverses set forth above with regard to these three claims is incorporated by reference. Further, Klug et al. do not disclose the use of a "plurality of fibers" which "addresses said recording medium support from different angles." The embodiment(s) of Figures 17 and 18 disclose only a single cable 650. The principle axis of the end of this cable (and, hence, the principle axis of the beam) is always perpendicular to the recording medium support. See Figure 17. Finally, angular variation is achieved through the use of "beam steering lens 405." Again, see Figure 17. Clearly, this structure does not meet the limitations set forth in claim 4. As to the embodiment of Figure 19, the reference beams are combined and, like the embodiment(s) of Figures 17 and 18, the principle axis of the resultant beam is perpendicular to the recording medium support. Again, change in angular orientation is achieved through the use of "beam steering lens 405." Again, this does no meet the limitation set forth in claim 4. Finally, there is no motivation in either reference to support the Examiner's claim of obviousness.

Achieved through incident at the recording medium different angle

No

As to claims 7-9 the traverse of parent claims 1 and 2 is incorporated by reference. As to claim 7, there is no disclosure in Klug et al. that the output ends are equally spaced from the recording medium support. As to claim 9, there is no disclosure

lens

of any of the claimed elements (e.g., "means for adjusting the angular orientation of said output end") in Klug et al., and the Examiner makes no assertion that they can be found (somewhere) in Klug et al.

The rejection of claims 15 and 16 is traversed for the reasons set forth above with regard to claim 1. The basis for the Examiner's conclusion is not supported by Klug et al., given the plurality of object beams and single reference beam, etc. this reference discloses.

While Klug et al. discloses the use of what they term a "SLM" and states that "LCD panels, cinematography, and transparencies have been used as SMGs," (see col. 4, *ll* 25-26), the rejection of claims 17-20 misses the point. What is the motivation for incorporating such structure in the system of Bencze et al. which is used to detect "errors on a photomask with respect to a standard photomask by subtraction technique?" (See, Field of the Invention.) Applicant submits that there is none and, thus, in addition to the reasons set forth with regard to claim 1, traverses the rejection of claims 17-20.

To provide object r-fraction

With regard to claim 25, the single beam steering lens 405 of Klug, et al. does not meet the limitation that "each" of the reference beams "includes means for manipulation." Accordingly, in addition to the reasons set forth above with regard to claim 1, the rejection of this claim is traversed.

Why not, ?

The rejection of claims 5 and 6 is additionally traversed. Benze et al. does not disclose optical fibers. Klug et al. does, but not for a different purpose. There is no disclosure of any fused optical fiber, nor any apparent need for one. Further, no motivation for using a fused optical fiber is disclosed or suggested in either of Bencze et al. or Klug et al. Kitamura, from a totally different class, doesn't supply any motivation

for the Examiner's asserted obviousness. Further, the Examiner does not even assert that Kitamura discloses the claimed "polarization maintaining splitter array."

In addition to the reasons set forth with regard to parent claims 1 and 25, the rejection of claim 26 over three references is also traversed. This cumulative adding of a third reference (Psaltis et al.) on top of a second reference (Klug et al.) on top of a first reference (Bencze et al.) makes no sense for no other reason than there is no reasonable purpose. The Examiner has made no attempt to explain why one would want to incorporate "shift-selectivity" into the apparatus of Benze et al.

The rejection of claims 37 and 38 is traversed. First, the Examiner's comments are directed to structure allegedly disclosed by Bencze et al. and Hart, and not steps. As set forth in col. 7, *ll.* 34-36, "[t]he holographic reading medium 26 in the holographic plane 25 (see Fig. 1) is illuminated for example by three reference beams, 38 41 and 44 . . . ." While this is done sequentially, there is no statement or suggestion that after each recording beam exposure the image is changed. While the Examiner has recognized this clear deficiency, she takes the position that it is somehow corrected by Hart. It is not. In Hart, while images are changed, he always uses the same single reference beam and the same object beam. Thus, Hart, like Bencze et al. does not suggest limitation (f) or (g). Also, there is no possible motivation because Bencze et al. is dealing with photomasks, while Hart is dealing with "different data slices."

Throughout the Office Action the Examiner has taken the position that Bencze et al. "does not teach explicitly" or the references "do not teach explicitly." It is Applicant's position, for the reasons set forth above, that the reference does not teach, suggest or imply any of the missing limitations, such as that the shutter for the object beam of

Bencze et al. can be placed between beam splitter 5 and holographic recording medium placed in hologram plane 25.

Finally, Applicant notes that despite the general references to claim 12 in the first paragraph of Section 2 and the first paragraph of Section 4 of the Office Action, nowhere is there any rejection of claim 12. Only claims 1 and 15 are discussed in Section 2. Similarly, in Section 4 there are specific references to claim 1, "claims 2-4, and 7-9," "claims 15-16," "claims 17-20," and "claim 25," but none to claim 12. Accordingly, because of this silence, Applicant understands that the Examiner considers that claim 12 is allowable.

In view of the foregoing amendments and remarks, it is submitted that this application is in condition for allowance.

Respectfully submitted,
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I claim:

1. (Currently amended) A holographic printer comprising:

(a) a source of coherent light;

(b) means for dividing said source into an object beam and a reference beam, said object beam having a beam path, said reference beam having at least one beam path;

(c) means, positioned along said object beam path, for positioning an image in said object beam path;

(d) means for supporting a recording medium in both said object beam path and said reference beam path;

(e) means, positioned along said reference beam path between said source dividing means and said recording medium support, for dividing said reference beam into at least three **[Britton, delete? Let's discuss]** identical reference beams, each having its own path, each of said reference beam paths intersecting said object beam path at said recording medium support; and

(f) a plurality of shutter means, said plurality of shutter means including a shutter means positioned in said object beam path between said source dividing means and said recording medium support, said plurality of shutter means also including a shutter means for each of said at least three reference beams.

2. (Currently Amended) The printer of claim 1, wherein said reference beam dividing means includes a plurality of optical fibers.

3. (Currently Amended) The printer of claim 2, wherein said object beam path, from said source dividing means to said recording medium support, has a given length, and wherein each of said reference beam paths, from said source dividing means to said recording medium support has said given length.

4. (Original) The printer of claim 3, wherein each of said plurality of fibers addresses said recording medium support from different angles.

5. (Original) The printer of claim 2, further including a fused optical fiber and means for dividing said fused optical fiber into said plurality of optical fibers.

6. (Original) The printer of claim 5, wherein said means for dividing is a polarization maintaining splitter array.

7. (Original) The printer of claim 2, wherein each of said plurality of fibers has an output end, each of said output ends being equally spaced from said recording medium support.

8. (Original) The printer of claim 7, further including means for supporting each of said output ends of said plurality of fibers.

9. (Original) The printer of claim 8, wherein each of said fiber support means includes means for holding said output end, means for adjusting the angular orientation of said output end relative to said recording medium support, and means for adjusting the distance between said output end and said recording medium support.

10. [canceled].

11. [canceled].

12. (Previously Amended) The printer of claim 15, wherein said plurality of shutter means are solid state means.

13. [canceled].

14. [canceled].

15. (Currently amended) The printer of claim 1, further including shutter control means for controlling each of said plurality of shutter means, said shutter control means including means for sequentially opening each of said reference beam shutter means, said shutter control means also including means for opening said object beam shutter each time one of said reference beam shutter means is opened.

16. (Original) The printer of claim 15, wherein said plurality of shutter means are non-mechanical.

17. (Original) The printer of claim 1, wherein said means for positioning an image includes means for holding a transparency.

18. (Original) The printer of claim 1, wherein said means for positioning an image is a liquid crystal panel.

19. (Original) The printer of claim 18, further including means for suppling images to said liquid crystal panel.

20. (Original) The printer of claim 19, wherein said means for supplying images includes computer means.

21. [canceled].

22. [canceled].

23. [withdrawn]

24. [withdrawn]

25. (Previously amended) The printer of claim 1, wherein each of said at least three reference beams includes means for beam manipulation.

26. (Previously amended) The printer of claim 25, wherein each of said means for beam manipulation includes a cylindrical lens.

27. [withdrawn]

28. [withdrawn

29. [withdrawn]

30. [withdrawn]

31. [withdrawn]

32. [withdrawn]

33. [withdrawn]

34. [withdrawn]

35. [withdrawn]

36. [canceled].

37. (Currently Amended) A method of forming a holographic image in a recording medium with a printer having an object beam path and identical beam paths, said method including the steps of:

(a) positioning a recording medium in both said object beam and said referenced beam paths;

(b) positioning an image in said object beam path;

(c) exposing said image and said recording medium to an object beam;

(d) simultaneously with said object beam exposure, exposing said recording medium to a first reference beam via one of said reference beam paths;

(e) changing said image;

(f) exposing said changed image and said recording medium with said object beam; and

(g) simultaneously with said second exposure of said object beam, exposing said recording medium to a second reference beam via another of said reference beam paths, said second reference beam being identical to said first reference beam.

38. The method as set forth in claim 37, wherein after each exposure of said recording medium by said object beam, said image is changed, and wherein with each exposure by said object beam, said recording is simultaneously exposed to one of a sequence of said at least three reference beams.